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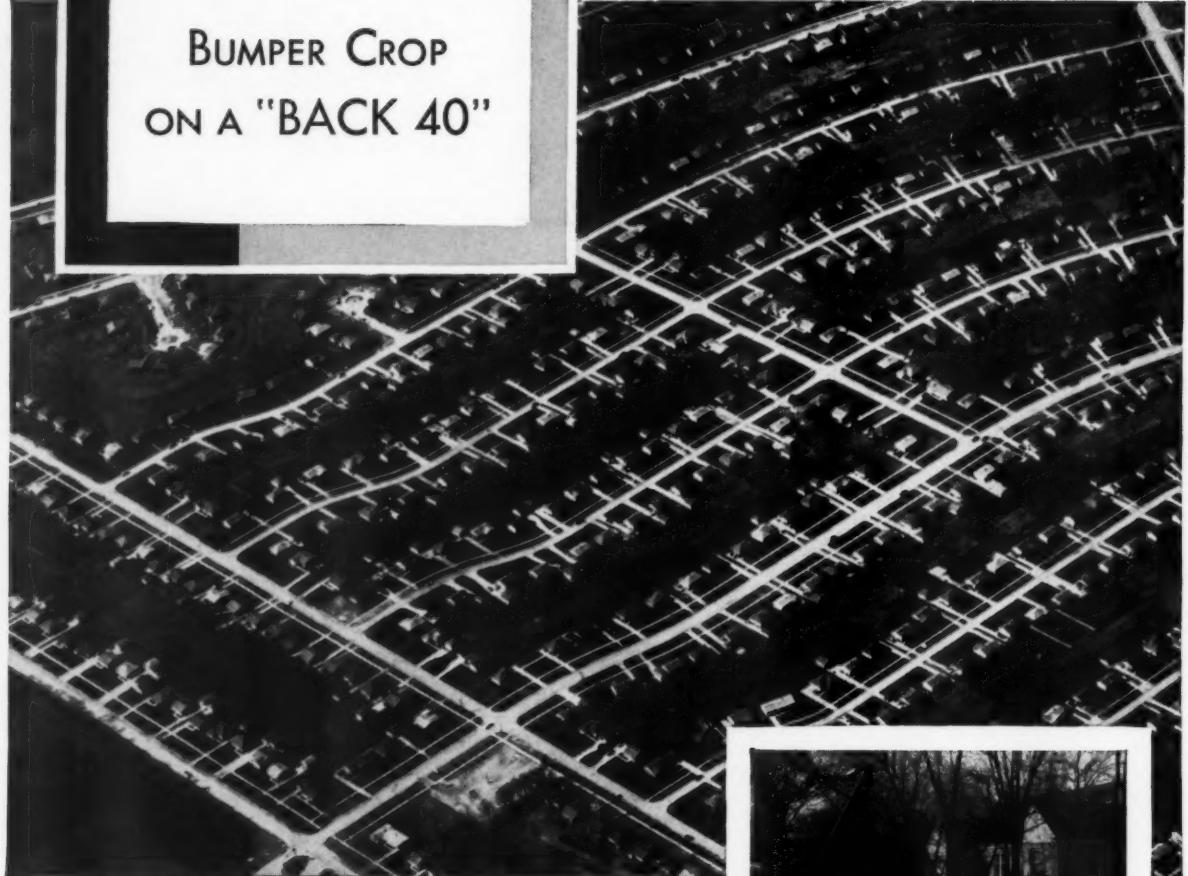
HISTORY OF HERSCHER GAS STORAGE PROJECT—PAGE THREE

Vol. 8

DECEMBER, 1955

No. 7

BUMPER CROP ON A "BACK 40"



(Chicago Aerial Industries, Inc., Photo)

Northern Illinois' fast-growing towns and cities, it's plain to see, are bursting at the seams with new homes. In many areas residential construction continues to spill over onto surrounding farm land. With this unprecedented housing boom has also come extensive industrial expansion and the enlargement of municipal and other facilities.

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COVER STORY

The Christmas season is again upon us. In the spirit of the season we present to you this picture of dignity and calm. Christmas, we agree, is a time for gaiety and joy. But it is even more a season for the contemplation of the better things of life. May this picture put you in a mood to help you do just that.

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A Brief History of

The Herscher Gas Storage Project

By O. C. Davis

The existence of a structure of considerable areal extent near the town of Herscher, Illinois has been known for many years. The first "Trenton" production in the state was discovered by shallow drilling on the Herscher structure following the turn of the century. Some 18 shallow oil wells were drilled with Cable Tools to an average depth of 200 feet. Oil with a small gas volume was encountered; however, the accumulation was not of commercial importance and after a short period of pumping, the wells were abandoned. Unlike present day rigid controls regarding well abandonment and plugging procedures, no attempt was made to plug these wells and farming was continued after the casing had been cut off below the surface.

The Herscher structure, as shown by subsequent drilling, is an elongated, north - south trending, asymmetrical, doubly - plunging anticline having an areal extent of some 8000 acres and a structural closure of 200 feet.

The glacial drift effectively masks any surficial evidence of the structure. The early subsurface control was afforded by shallow water well data and the structural information from the old oil field. The youngest formation encountered beneath the glacial drift is the Kankakee limestone of the Silurian and the oldest is the Mount Simon sandstone of the Cambrian period. These lower Paleozoics consist of an alternating sequence of clastic rock units; of shales, sandstones, limestones, and dolomites. These formations are remarkably consistent in lithology and thickness over the entire structure.

The proximity of this structure to company pipeline facilities and market, in addition to the satisfactory estimate of gas storage volume that could be stored in the Galesville sandstone aquifer,

brought about a detailed study of the area.

One hundred and four shallow test holes were rotary drilled to the top of the Galena formation, a readily recognizable marker encountered from 150 feet to 350 feet in depth. These structure tests were located on the intersection of section lines and covered an area of roughly 11 miles in a north-south direction and seven miles in width.

The subsurface position of the top of the Galena at each point was calculated and placed on a base map. By contouring these points, the structure on the top of the Galena was obtained. This map, then, indicated the size and shape of the structure, its trend and amount of dip or slope from the highest point outward in all directions.

Four deep tests were then located so as to afford more subsurface control. These tests were drilled and cored through the Galesville sandstone aquifer which was to become the gas storage reservoir. The tests were cored, as has been mentioned and pertinent information obtained concerning the porosity and permeability of the reservoir and the adequacy of the cap rock immediately overlying the reservoir.

A total of 21 injection-withdrawal wells were completed in the Galesville sandstone on the crest of the structure, using 660 foot spacing.

To protect potable surface waters, 13 $\frac{3}{8}$ -inch casing was set, usually 100 feet into the Galena formation with the cement circulated. An 11-inch hole was rotary drilled to the top of the Galesville reservoir, and after electric and microlog surveying, 8 $\frac{1}{8}$ -inch production casing was set on bottom with the cement circulated. The cement plug was drilled out with cable tools and the Galesville sandstone penetrated a minimum of 10 feet. Each well was swabbed to clean the sand face of drilling mud and possible cement contamination.

Thirteen observation wells were drilled on the structure to the top of the reservoir at down-dip positions on the flanks to observe water levels and follow the movement and effect of the gas bubble that was to be created.

Gas injection was started on April 1, 1953 using two 150 HP compressors with a total capacity of 15 MMCF per day. Gas for storage operations was piped from a point on the Texas Illinois system near Dwight, Illinois with a single 30-inch line.

A 10,000 HP compressor station and a dehydration plant with 300 MMCF per day capacity was constructed to handle the gas on injection and withdrawal.

Initially, the five structurally highest wells were used for injecting gas into storage. The main plant was put into service on July 1, 1953. Injection rates were stepped up to approximately 200 MMCF per day with the large units.

During the last week of July, 1953, after gas has been injected for 4 months and the gas bubble in storage was under all injection-withdrawal wells at a thickness relative to their structure position, one of the shallow water wells in the town of Herscher began to bubble gas. During the following week, a total of 33 village water wells, normally bottomed at around 100 feet, became active with gas.

At the same time, the only oil well that was opened to the surface became active. The volume of escaping gas from this well increased steadily to an estimated volume of 1.5 MMCF per day in a period of one week after it started flowing gas. After the well had reached the 1.5 MMCF rate, it began flowing water. There was sufficient pressure to support an 80-foot column of water.

Gas injection into the reservoir was stopped one week after leakage had been detected. The old oil wells were located, cleaned out to the original bottom and allowed to vent. It was apparent that the

Mr. Davis, superintendent of storage, Natural Gas Storage Company of Illinois, presented this paper before the Western Society of Engineers at the Society's headquarters in Chicago on Sept. 27, 1953.

Galena formation had in some manner been pressured with injected gas and if enough adequate vents could be drilled, the activity of leakage gas in town could be materially decreased, perhaps even stopped. A Galena well was drilled beside each injection and withdrawal well, cased and allowed to vent to the atmosphere.

Meanwhile several theories were advanced as possible explanation for leakage from the reservoir at 1,750 feet into the 150-foot level. They may briefly be summarized as follows:

1. Faulty cementing. The cement could have channeled between the casing and the bore hole providing several small avenues of escape at one or more locations.

2. Lack of adequate cap-rock. The hard, dense dolomite immediately overlying the sandstone reservoir could be porous in some areas, and permit the upward migration of storage gas.

3. Faulting. The upwarping of the strata necessary to produce such a structure could possibly have exceeded the elastic limit of the overlying formations

and caused fracture or caused faulting.

4. Old well. Approximately 20 old oil tests have been located. There was a possibility that one or more deep tests could have been drilled to the deeper horizons; possibly the gas storage reservoir.

In August, 1953, shortly after leakage occurred, Lane-Wells Company surveyed each well drilled at Herscher with their Gamma Ray and Neutron logging equipment. This type of survey has been used to locate gas-producing zones and it was hoped that small gas-charged zones behind the casing, if present, might be located. Nothing of any consequence was found by this means of testing. Five wells were drilled and completed to each of the formations between the Galena and the Galesville sandstone reservoir.

No evidence of gas was found in any of the intermediate formations between the Galesville and the Galena. In addition, 21 shallow structure tests to the Galena were drilled in areas of steep dip to check the possibility of faulting. The dip in one of these areas was relatively steep; however, there was no evidence of any displacement or discontinuity of section.

Sensitive thermistors were used to survey each well from the total depth to the surface. If gas was leaving the casing at any point, the resulting cooling would be observed. Down-the-hole microphones were run in each well to ascertain if there were any extraneous noise levels. The thermistor, microphones and gamma ray neutron surveying did not indicate any positive evidence of gas leakage or migration upward through the 1,600 feet of overlying sediments between the Galesville Sandstone Reservoir and the shallow Galena formation.

In addition to the aforementioned more or less standard procedures for locating casing leaks, the injection-withdrawal wells were "killed" with water. This practice consists of loading the hole with water and maintaining a constant level at the surface. This technique will effectively "shut-off" a leak behind the casing. The program of well-killing had no apparent effect on the vent gas rate.

Other testing and leak detection procedures new to the industry were tried after the conventional tests previously

(Continued on Page 13)

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An Explanation for Top Executives

Corporation Presidents and Automation

By Henry Blackstone and Charles N. Kimball

Consider automation, first of all, as an extension of existing mass production techniques and systems. It is a new tool which has brought further advances in these techniques. Technical developments in the last decade, with principle emphasis on electronic measurement, computation, and control, have made automation possible.

But corporation presidents must realize that automation is not applicable to all manufacturing and processing plants without due considerations of economic factors. It cannot be put to work on production lines on a piecemeal basis. One cannot introduce a piece of a system here, or a shelf-purchased item there. What is of paramount importance, as far as top executives are concerned, is that close attention must be given, in any consideration of automation, to a strong operations research approach, including an extensive system analysis.

A good beginning is some knowledge of industrial history. The mass production system has developed historically through five steps up to the present time.

The first step was the age of the tote-box, and the single machine tool. This involved cumbersome and costly packing and unpacking of materials into the tote-boxes. The second step was the development of multiple spindle tools, performing like-operations. The third historical step came with the development of multiplexed function tools, tools which combined the operations of drilling, grinding, milling and other similar processes in one machine for a particular product. Fourthly, followed the perfection of irregular tools capable of following irregularly shaped cams, templates and tracing machines. Finally, mass production rolled successfully into the moving belt line. On belts, machines and

human operators were combined to perform operations in sequence, eliminating completely the packing and unpacking work of the original tote-box.

Now automation entered the industrial scene. By it, three additional steps were added to the manufacturing process. First of these, and the sixth step in industrial history, was the principle of automatic gauging and measurement, permitting the development of automatic inspection stations and their use in mass-production's belt lines. Second, and the seventh major industrial step, was the continuous flow of materials from the raw to finished stage from receiving to shipping ends of the factory. Third, and the eighth step in the application of automation to the mass production system, was the development of machines capable of performing irregular functions. These machines were made possible largely through the highly developed electronic computing techniques invented over the past 10 years, and the development of data processing and handling techniques such as magnetic tape computers and perforated tape readers.

With this capsule history in the back of his mind, the corporation president may consider his company and automation. He may say to himself: "I want it." Here certain necessities arise. He will find, for instance, and this frequently happens, that it may be necessary for him to redesign his product as well as redesign his manufacturing process, in order to permit automatic filling of the bottles for example. A different type bottle was required to permit this one application of automation. Another, and better example of product change to meet an automated situation, is involved in printed circuits. In the printed circuit, there are no longer any wires, or any soldered parts, or, in fact, three dimensional components. All the components and the wires are printed in two dimensional form. Thus, it can be seen that automation may require as much re-

thinking of the process as it involves concept in design of the system components which provide the automation.

Probably because computers are so far advanced today, the corporation president is likely to find that present applications of automation are best exemplified in the office, in the data handling aspects of today's industry. Here we have a new way of processing and presenting information rapidly. The problem is one of material handling, not merely a new way to sort the same number of papers or cards.

Here again it must be understood that the president cannot simply buy a computer, irrespective of its cost, and merely have the salesman plug it in. An elaborate study becomes essential. The president will wisely turn to the operations research or systems analysis approach previously mentioned, in order to fit the computer, irrespective of size or cost, into the problem being solved.

The president should also think of automation as not being merely a method of reducing costs, but also for improving quality and uniformity.

In reviewing what has been written so far, it will be realized that since the start of the industrial revolution there have been eight steps forward taken by industry. Today we are in a position where the ninth step is possible and will be taken.

This step, this ninth step, is the creation and complete exploitation of the basic concept of systems thinking, systems planning, and systems engineering. It is only through taking this step, the analysis of the total problem through the systems approach, that the full benefits of automation can be achieved in factory design, manufacturing process, or office detail.

Having reached this ninth step, the question confronts the president of the social impact of automation. The principal concern of labor leaders that automation will result in widespread unem-

Mr. Blackstone, president, Servo Corporation of America, New Hyde Park, N. Y. and Dr. Charles N. Kimball, president, Midwest Research Institute, Kansas City, Mo., presented this Seminar report on Automation, conducted before the 5th Annual School for Presidents of the Young Presidents Organization on June 27, 1955.

ployment and decrease in jobs, we do not believe is valid. Our belief is based on the same reasons which have existed when each step of the industrial revolution was taken toward achievement of mass production. Specifically, as production becomes more automatic, costs decline, jobs become upgraded, and employees must become better educated and trained. As a result, wages will be increased. With wages increasing and prices declining, the purchasing power of the nation will continue its steady rise as it has from the very beginning of American industry. Automation will, in fact, fall into step with the concept of an ever-expanding American economy.

All great technological changes have brought about changes in sociological and philosophical concepts. Fortunately, automation will not hit the country at one fell swoop. It will only be gradually introduced into our society. Its year by year effect will not be felt. But just the same over a long pull, great responsibility is now being placed on other segments of our society than business.

Look at it this way: Automation, first of all, releases the human operator from many menial jobs, upgrades everybody's responsibilities, physically, mentally and ethically. It elevates the human being to new stations in life, which, of course, is the historic pattern throughout the entire industrial revolution.

Automation is going to require more and better trained technical people, engineers, physicists, chemists, economists, mathematicians, people skilled in systems analysis and operations research. It may be that our young people will not be able to get this kind of training in just four years of college. In all educational institutions, there will be a heavy demand for improved teachers of science and engineering.

In all likelihood the work week will be reduced. There will be more time for leisure. The motivation for increased study will arise. More emphasis will be put on adult education. So, all along the line, as automation flowers, not only the opportunities but the responsibilities for all will be upgraded.

No
General Meeting
is scheduled
for December
because of the
Holiday Season.

However, the Western Society of Engineers wishes to all its members, their families, and their friends, a most

Merry Christmas
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Happy New Year.

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Lath Company Is In New Quarters

With all design, production, shipping and office facilities under one roof at their new plant in Addison, Illinois, Powell Steel Products Company officials and employees are enjoying a new experience in the company's steady growth. Founded in 1943 by J. L. Powell, now chairman of the board, the company is fast becoming an important factor in the design and manufacture of metal lath accessories for the lathing and plastering industry. Commenting on the company's new quarters, John G. (Jack) Stemples, MWSE, Powell president, says:

"With our people under one roof, we're able to save many steps. For example, we're processing and shipping all orders within 24 hours. You can well imagine how our old operation in Chicago split between several buildings and the high traffic there had a number of operational disadvantages. And just for the record, Larry Powell and I are still blushing; when we planned our building several months ago, we never in the world suspected that we would be scouting around for additional warehouse space within a week after we moved in, but that's what has happened. Thank heaven that we have acquired the property adjacent to our new plant for future expansion!"

The company's modern, one-story plant has been carefully laid out to expedite the flow of raw materials through production on specially designed machines into warehouse space accessible for prompt shipment either by truck or railroad car. Company trucks deliver within a forty mile radius of the plant, and railroad cars are loaded on an Illinois Central siding at the rear of the plant for distant shipments. Says Stemples:

"We know that our progress depends on our ability to design, produce and deliver quality lathing and plastering accessories promptly at the lowest possible cost. Every sale that we make, no matter how small, is important to us. One-case orders are handled with the same speed and care as a full carload.

"We're a small company in a highly competitive field; therefore, our design, production and sales staff must work together very closely. Our employees know this and accept unusual personal

responsibility for our products. For example, each machine operator is his own inspector. He has been selected on the basis of ability to maintain close quality control at all times."

From its very start, Powell has maintained an excellent employee relations program including company paid medical and hospital insurance. This program has been steadily augmented as the company has increased its business. More recently, Powell is studying a comprehensive profit-sharing plan for all employees.

Larry Powell recalls the early days of his company when his complete line consisted only of short flange casings in $\frac{1}{2}$ inch to $\frac{3}{4}$ inch grounds. From this early start, using streamlined manufacturing methods, the company went on to welded flange casings, and then into integrally expanded casing beads in all styles and lengths, corner beads, base screeds and picture moulds. Newest in the line is a $\frac{7}{8}$ -inch base screed which has just been introduced to the trade, and two new expansion joints are just about ready to pop out of the incubator. The key to the growing line of Powell

metal lath accessories has been the company's ability to streamline production techniques. It was one of the first in the entire field to manufacture its products by automatically feeding steel coils into specially designed machines that fabricate with minimum handling. In addition, it has always been company policy to maintain a large inventory of both raw steel and finished shapes to fill customers orders on short notice. To assist the dealer or lathing and plastering contractor in selecting the lathing accessories needed, the company has recently designed a compact display illustrating 17 of the more popular Powell beads and casings.

In Larry Powell's opinion, the growth of the company can be attributed mainly to the fact that all Powell executives came to the company with long and useful experience in the lathing and plastering field, or with strong production and methods backgrounds. Powell, for example, had served previously as vice president in charge of sales for a manufacturer of metal lathing specialties. Stemples came from U. S. Gypsum where he had been merchandising manager for lathing and plastering materials. Other Powell executives, including



Jack Stemples (MWSE), left, and Larry Powell discuss some of their products. Seventeen of the more popular shapes are mounted on compact display board.

Maurice Finder, vice president; R. R. Lyons, treasurer; and A. E. Garfield, secretary, have brought the company mature judgment in production, accounting, and methods.

The company maintains a continuing research and development program. "We must look ahead and plan ahead," insists Stemples. "By keeping in constant touch and learning the needs of lathing contractors, architects, building supply dealers and plaster material producers, we are better qualified to serve the industry." Actually, many items in this field do not move in large enough volume for major manufacturers to produce solely for their own use. In many instances, Powell Steel supplies the needs of these companies as well as their own direct customers. By consolidating these industry requirements, Powell justifies investment in a complete tool and die department to make the necessary dies and custom built production equipment.

Perhaps the best reason for Powell growth, is the deep personal interest in the company shown by employees. In the move just completed, not one employee left the company, although in many instances, this move meant uprooting of families or long and tedious commuting by those who preferred to remain in their old Chicago neighborhoods.

Even on non-working days, part of the Powell staff turns up at the plant to fuss with ideas to better the company's products or to improve production. With every employee imbued with a strong sense of personal responsibility toward his work, the company has been able to increase productivity and reduce waste. Fortified by this example of complete management-employee cooperation, Powell Steel Products Company shows every indication of becoming an increasingly important factor in the lathing and plastering industry.

Tracks of Wood

Ever hear of wooden streetcar tracks? Well, they had 'em in Salem, Ore., years and years ago, according to the National Lumber Manufacturers Association. In fact, workmen digging a water main ditch in Salem recently unearthed a stretch of wooden streetcar tracks which hadn't been used in 40 years. The men said the tracks were still in excellent condition.

Hitchcock Makes Report on Smog

Dr. Lauren B. Hitchcock, president of the Air Pollution Foundation, said recently that the scientist and engineer have made definite strides toward reducing two of three major smog components—but work must be stepped up on the third and most difficult one of all—oxides of nitrogen.

"Much work has been done in the laboratory and in industrial plants on reducing organic compounds and visible particles," he said, "but if we are to cure our smog problem, we must find ways and means of limiting our production of all three."

He said the invisible organic compounds, of which there are hundreds,

react with oxides of nitrogen, under sunlight, to produce smog. The third type—the very fine airborne dusts—"add to certain smog effects," he said.

Making his second annual report to the Board of Trustees of the Foundation, Hitchcock emphasized that not all answers have yet been found on the sources and possibilities of controlling either visible particles or organic compounds. He emphasized that the latter includes not only hydrocarbons, which is a huge family in itself, but also acids and aldehydes. Some come from petroleum products such as gasoline, lubricating oil and fuel oil. Others come from the burning of rubbish and evaporation

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"We must learn how to control this third culprit, the oxides of nitrogen," Hitchcock said. "We have made some progress on the first two, but not nearly enough. Auto exhaust control devices about which you will hear from others in detail are presently aimed at reduction of part of the organics. Partial reduction of any one type, good as it is, in our opinion can hardly be expected to produce a revolutionary change in our average smog conditions."

Dr. Hitchcock made a renewed recommendation as to how to approach this triple-threat job — a testing chamber, duplicating Los Angeles Basin.

"Among all the jobs that lie ahead of

us on the road toward victory over smog," said Hitchcock, "the construction of an air resource test facility we consider foremost."

He said plans are now being drawn up for a testing chamber, completely equipped with controls and instruments, by the Department of Engineering at the University of California at Los Angeles with the cooperation of the Air Pollution Control District and the Air Pollution Foundation. This chamber is intended to provide accurate and reliable information as to the importance of various atmospheric pollutants and how much smog will be reduced or eliminated by any one or more of them.

"Of perhaps greater importance to us," he concluded, "would be our ability to test the various remedies that have been and will be suggested. In this way, the public would be assured that any remedy recommended to it or required of it was workable, worthwhile and economical."

Returning to the problem itself, he said that steps taken by the industrial plants in the Los Angeles Basin to reduce output of smoke from stacks illustrated the curtailment to date of visible particles.

"But science has not yet begun to explore the control of oxides of nitrogen, which the chemist finds in our air at any time or place," he said. "The air we breathe is about 20 per cent nitrogen and 20 per cent oxygen. Whenever we burn anything in an industrial plant, or when there is combustion of gasoline in the auto, paper in the incinerator or fuel oil in a furnace, the air going through the flame is heated sufficiently so some of the oxygen and nitrogen combine."

The Foundation president said certain probabilities stand out as types of remedies likely to prove successful.

1. Control of domestic burning of rubbish by substituting cut-and-fill disposal until improved designs for municipal large-scale incinerators can be developed.

2. Further control of airborne particles from industrial stacks must be attacked from two standpoints: improved combustion could eliminate organic mists, but particles of ash must be removed from stack gases by physical or chemical means. Both approaches need further research.

3. Further control over hydrocarbon and solvent losses by evaporation means extension of vapor recovery or combustion control systems. Much engineering development will be required to develop economic equipment for this.

4. An effective method still must be produced to control hydrocarbon emissions from internal combustion engines, but four areas show promise: fuel cutoff devices operating during deceleration, exhaust converters (catalytic or non-catalytic), fuel injection and improved maintenance.

He numbered among the Foundation's achievements during the past year the investigation of alternate motor fuels, such as alcohol, liquefied petroleum gas, alcohol-gasoline blends and fuel not containing tetraethyl lead. He said devices

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had been evaluated for control of unburned motor fuel in the auto exhaust. The Foundation developed or helped to develop continuous, around-the-clock measuring instruments for air contaminants; it focussed attention on the need for continuous monitoring of pollution.

"The Foundation," he said, "has sponsored technical conferences in Los Angeles which brought the help of national authorities to bear on motor vehicle exhaust, sanitary rubbish disposal, formation and analysis of aerosols, smog-forming chemical reactions and relation of our weather to smog."

Twelve technical reports on basic aspects of the problem were published, then sent to laboratories, air pollution experts, libraries and universities here and abroad.

Hitchcock said the Foundation's goal for 1956 research is a budget of \$750,000, which would be \$200,000 more than was obtained from the Foundation's contributors in 1955. He said 74 cents of the Foundation's dollar goes for direct research. General and administrative expenses, he added, amount to only 16 cents or 22 per cent of direct research—"as compared with 80 to 120 per cent typical of most industrial research."

"Are we any nearer to a solution?" the Foundation president asked.

Hitchcock said if the answer were anything but affirmative, the Foundation would shut up shop, but to solve these problems, "we must (1) establish limits for important pollutants and (2) develop control mechanisms based on these facts."

He said that with this base, "we can develop control measures just as surely as scientific men can develop jet aircraft or man-made satellites." But the solution will not be quick or easy.

"There is a third problem," he cautioned, "one not under the control of the scientists. This is the willingness of the community — which includes business, industry, the public and government—to spend the necessary money and to accept the necessary controls."

This applies, he said, to an auto device, whether it cost \$15 or \$150 originally, not including inspection, maintenance and a measure of inconvenience. This also applies to industry, which may have to develop and install devices for further control of hydrocarbons, nitrogen oxides and possibly other pollutants. He

said the willingness of the industrial community to spend the necessary money and to accept the necessary controls, has been demonstrated and may be relied upon in the future.

The Foundation's program, he said, is "get the facts, develop and test controls and get public acceptance."

Forty-seven % More

There will be 47 per cent more women drivers on the road five years from now and in ten years, there will be 91 per cent more, *National Petroleum News* reports. This will mean an increase in the number of women drivers from 25 million last year to 35 million by 1960, and 47 million by '65.

American Motorists Log 560 Billion Miles

Sixty-one million registered motor vehicles and 72 million licensed drivers in the United States today are piling up mileage at the unprecedented rate of more than 560 billion miles a year, the Automobile Manufacturers Association reports.

This is an average of approximately 9,200 miles per vehicle, and 7,800 miles per driver.

The AMA released these and hundreds of other facts about highway transportation and the automotive industry as it introduced the 35th edition of its annual statistical handbook, *Automobile Facts and Figures*.

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ICS Adds General Electronics Course

To prepare students for careers in the fast-growing field of electronics, the International Correspondence Schools of Scranton, Pa., has added a General Electronics Technical Course to its curriculum, according to John C. Villaume, Dean of the Faculty.

A recent U. S. Bureau of Labor Statistics report indicates a bright future for electronics, with more than 750,000 Americans currently employed in this field. The report states that theoretical knowledge and background is much more important in electronics than in most other skilled occupations, with aptitudes in mathematics and basic science essential to success. The survey also reveals

that 41% of the electronic technicians interviewed acquired their skills through correspondence courses and home study.

Primarily directed to those considering electronics careers, the General-Electronics Technician Course is also designed to help those already working with servomechanisms, military fire control equipment, navigational aids, geophysical survey equipment, electronic business machines, and applications of electronics to automation.

Comprising 50 instruction units, requiring an estimated average study time of 850 hours, the course includes instruction in seven general areas: Mathematics, Basic Science, Electrical Theory, Electrical Equipment, Basic Electronics, Industrial Electronics, and Communication Electronics.

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Methods Conference Assembles Dec. 8-9

How can industrial engineering save the taxpayer money, help settle labor difficulties, and assist management in operating more efficiently?

A two-day Methods Improvements conference at Illinois Institute of Technology, Chicago, Dec. 8 and 9 dealt with these and other related questions.

Engineering leaders in government, business, labor, and education discussed industrial engineering problems in 12 workshop sessions in the Commons building, 3200 S. Wabash avenue.

Joseph C. Moquin, director, Armed Forces Management Engineering school, told how recent methods improvements have helped the armed forces save taxpayers' money.

Two prominent labor engineers participated in discussions on new problems that confront the worker because of improvements in engineering methods.

Robert Kantner, engineering division head, national headquarters, CIO United Auto Workers, and Ross Groshong, former international representative, AFL United Textile Workers, told labor's attitudes towards wage incentive plans, automation, and standards engineering.

Dr. Norman H. Barish, industrial engineering department chairman, New York university, spoke on "Systems Analysis for Effective Administration." Barish showed management ways of developing the easiest, most efficient, and least expensive means of accomplishing tasks.

Other sessions dealt with systems, methods, and human engineering; commercial engineering research; new frontiers in quality control; improved control sheets, charts, and graphs; capital equipment and replacement policy; operations research techniques, and the impact of electronics on methods.

The conference was sponsored by the Illinois Institute of Technology department of industrial engineering in cooperation with the Illinois Manufacturers association, Industrial Management society, Society for Advancement of Management, American Institute of Industrial Engineers, American Society for Quality Control, National Association of Cost Accountants, and other professional societies.



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Herscher Storage Project

(Continued from Page 4)

mentioned had been completed. The use of a radioactive tracer to locate gas movement behind the well casing was first attempted at Herscher. Argon 41, a radio-active isotope of Argon gas, with a half-life of 109 minutes was used. Cylinders of Argon were irradiated at the Argonne Laboratories and transported to Herscher by car immediately upon removal from the reactor. The irradiated gas was transferred to a cylinder under 2,000 psi pressure that was equipped with a time release mechanism. Each well scheduled for this test was plugged back to the casing shoe with road-mix limestone. The cylinder of Argon 41 was lowered into the casing until the end of the cylinder was set directly opposite the shoe. Immediately following, Lane-Wells Gamma Ray instrument was positioned approximately 20 feet above the cylinder to detect the movement of radio-active gas behind the casing. It was discovered that by inject-

ing and withdrawing a few linear feet of pipeline gas into and out of the well during the testing program that the radio-active cloud in the casing could be carefully controlled and maintained at the shoe level. All injection-withdrawal wells were tested twice in this manner; first with 100 Millicuries of intensity, and later with 200 Millicuries. There was no indication that injected gas was migrating upward behind the casing of any of the wells.

A Thermal Tracer device was developed and all injection wells were subsequently tested with this instrument. This instrument was designed on the principle of a heat source combined with very sensitive thermistors. In the operation of the instrument, it was positioned a short distance above the shoe on the bottom of the well and by reciprocating motion, a small pump was actuated that inflated a rubber bag on the instrument that effectively sealed off the flow of gas in the casing. Heat was then applied by electrical heating elements, until the area surrounding the instrument had reached an equilibrium temperature in excess of the normal subsurface temperature encountered at that depth. Any temperature fluctuations detected by the thermistors were registered and plotted by a surface recorder. This test was final proof of the soundness of all wells.

At this time, sufficient observation had been made on the leakage gas collecting in the Galena formation to determine that the vent wells drilled to this formation were effectively preventing a pressure build up in the Galena. It was felt that the next step to provide means of recovering the escaping gas and developing a

system that would permit economic operations of storage until the source of the trouble could definitely be determined, was to lay a gathering system to the Galena vent wells and attempt to gather the leakage gas and re-cycle it to the storage horizon. In January of this year a pilot system was connected to 10 Galena wells and gas was re-cycled with a 3-stage, 660 HP unit. This system was operated for a period of three months handling volumes of approximately 2½ MMCF per day with only minor difficulties. It was decided, after this period, that the next course of action would be to tie-in all Galena vent wells to the main compressor station and modify the equipment in the main plant for 3-stage operation to re-cycle all leakage gas. This system has been in service for two weeks at this writing and is effectively controlling the leakage gas in the Galena with no appreciable gas loss.

While tests and construction work was in progress on the vent gas gathering system, other testing programs were started to provide more information on the reservoir. A magnetometer survey is approaching completion at this time. The magnetometer is a sensitive magnetic measurement device that will effectively measure magnetic intensity deviations from base background. Subsurface metal deposits can be located within a very short radius due to the magnetic intensity concentrated at these deposits. To date, one well not previously located has been found by this means.

A geochemical survey was taken over the structure to outline, if possible, the extent of the old oil accumulation in the shallow Galena and to determine if the

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extent of gas in the Galesville reservoir could be detected. This method is predicated on the concept that all naturally occurring oil and gas reservoirs leak; not over the reservoir, but around the periphery. Thus, a soil sample, when analyzed for hydrocarbons, will evidence a concentration or "halo" effect around the accumulation. One hundred and thirty soil samples were collected from as many stations at a depth of 12 feet. The analysis separated the hydrocarbons into 2 fractions: Methane and Ethane. No anomalies were evidenced from this survey.

This briefly summarizes the development, testing and remedial work that has been done on the Herscher Storage Project since the project was started. Other forms of testing that will more definitely pin point the source of gas leakage are being finalized at this writing. It should only be a question of time until all factors causing leakage will be definitely determined and corrected. In the meantime there is no doubt that the steps which have been taken to prevent surface venting will allow the project to proceed to a successful conclusion.

Heavy Construction Volume Increases

Dollar volume of design work on heavy construction engineering projects was up 30 per cent in 1954 over the previous year, according to a survey just completed by *Engineering News-Record*, McGraw-Hill publication. At the same time, the number of consulting engineer firms taking on new jobs totaling \$100,000 or more increased five per cent during the year.

Sparking the big increase in design work in 1954 were highways, bridges, and earthwork and waterways. New highway design work represented 164 per cent more dollar volume than in 1953, while bridge design work rose 30 per cent and earthwork and waterway volume rocketed by 86 per cent over last year.

Waterworks dollar volume increased five per cent, industrial building three per cent, and airport design work one per cent last year, while unclassified construction work increased eight per cent in dollar volume. However, dollar volume was off in some fields; sewerage jobs dropped 24 per cent, non-industrial

buildings (commercial, private housing and public) dropped 16 per cent, and federal work handled by consultants dropped 42 per cent below the 1953 level.

Gyro-compass Makes A Successful Flight

For the first time a true north-seeking gyro-compass of traditional battleship accuracy has been successfully operated in flight.

This historic event—incident to tests by the Corps of Engineers Research and Development Laboratories, Fort Belvoir, Va.—highlighted a continued exhibition by the Arma Division of American Bosch Arma Corporation for the Armed Forces.

For its initial flight, the beginning of a series of demonstrations to focus attention on the applicability of high-accuracy gyro-compasses over a wide range of military navigational requirements, the gyro-compass was mounted near the pilot in a conventional military helicopter. As regularly installed, it would be located out of the way, and only a repeater would be mounted with other instruments in the cockpit.

The gyro-compass, which has no magnetic reference, is no larger than a paratrooper's boots. It can be carried easily in one hand and is rugged enough to

perform accurately in an Army tank operating in rough terrain.

Concurrent with the airborne tests, general exhibition to the military was undertaken by Arma as a pre-announcement showing of the division's advances in gyroscopics, exemplified by the Subminiature Gyro-Compass which is now in factory production.

Being proved are many facts which herald early solutions not only to the puzzling problem of all-weather, all-area helicopter navigation, but also solutions to many facets of navigating other airborne vehicles and land and water craft which are unable to accommodate the greater bulk of earlier high-accuracy gyro-compasses.

Most important, perhaps, is that environment on land or sea or in the air does not deteriorate the high accuracy of the instrument.

The compass neither has to be handled tenderly nor to be operated by skilled personnel. Also, it is not susceptible to magnetic storms, changes in magnetic structure of vehicle frame, and d.c. fields from motor or radar operation. In addition, it eliminates deviation corrections and permits high-latitude operations.

Details of the Arma subminiature gyro-compass are not classified and the instrument may be made available for commercial as well as military operations.



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Senator Anderson Speaks at EJC

Senator Clinton P. Anderson of New Mexico, chairman of the Joint Congressional Committee on Atomic Energy, was scheduled to speak on "Atoms for Progress" at dinner Thursday, Dec. 15 at the EJC Nuclear Engineering and Science Congress in Cleveland. Senator Anderson will be the principal speaker in connection with the Conference for Management on "The Place of the Atom In Your Business."

He will be introduced by Dr. T. Keith Glennan, president of Case Institute of Technology and former member of the Atomic Energy Commission.

The dinner, to be held at the Hotel Statler, culminates a day-long conference sponsored by the Cleveland Engineering Society and designed to acquaint management with the possibilities of nuclear energy in various fields of industry. The delegates will also hear Charles Robbins, executive director of the Atomic Industrial Forum on "Atoms, Cutting Across the Business World"; Eugene Zuckert, nuclear consultant, Washington, D. C., on "Getting Into the Nuclear Field"; O. B. Falls, Jr., manager, Marketing, Atomic Equipment Department, General Electric Co., on "Atomic Energy Off the Shelf." Also L. R. Zumwalt, Nuclear Engineering and Science Corporation on "Present Industrial Uses—Nuclear Energy"; A. W. Meyer, director, Exploratory Research, Diamond Alkali, on "Setting the Budget for Your Small Hot Atomic Laboratory" and Ralph J. Watkins, director of Research, Dun & Bradstreet, who talks on "Atomic Energy and Its Place In Your Business."

This conference is a part of the Nuclear Engineering and Science Congress to be held in Cleveland from December 12 through December 16, attended by representatives of 26 national engineering and scientific societies and coordinated by the Engineers Joint Council.

Wet States

Seventeen western states use some 77 billion gallons per day of water—the same amount used by 31 states in the East, according to *Electrical World*.

Industrial Dispersion Considered at Meet

Dispersion of industry as a possible answer to the threat of atomic attack was considered Thursday, Nov. 17, at the A-Bomb and Industry conference at Armour Research Foundation of Illinois Institute of Technology, Chicago.

Discussing "Dispersion—a Vital Prescription for Survival" was Lieutenant General W. S. Paul, assistant to the director for plans and readiness, Office of Defense Mobilization, Washington, D. C.

Paul's address was one of six aimed at giving industry an integrated picture of conditions likely to prevail after an atomic bomb attack and the possibilities of advance protective measures.

Another talk which interested industry representatives, attempted to show how much money a company should spend in protecting itself against possible attack. The topic was covered in a talk on "The Economics of Plant Protection," by S. F. Clabaugh, industrial defense consultant, Washington, D. C.

Other talks scheduled included:

"The Need to Prepare," Robert L. Janes, assistant manager, propulsion and structural research department, Armour Research Foundation; "Operational Planning to Meet Disaster," J. H. Redmond, manager of operations, Koppers Company, Inc., Pittsburgh.

"Protecting the Existing Plant," Raymond W. Sauer, supervisor, structural analysis section, the Foundation's propulsion and structural research department; "A Philosophy for Anti-Blast Structural Design," N. M. Newmark, research professor of civil engineering, University of Illinois, Urbana.

E. H. Schulz, MWSE, assistant director of Armour Research Foundation, gave the welcoming remarks and Herbert B. Gausebeck, manager of program development at the Foundation, summarized the main points of the conference.

EJC Assembly is Slated for Jan. 26-27

The second annual General Assembly of Engineers Joint Council will be held Thursday and Friday, Jan. 26 and 27 at the Hotel Statler, New York City. The problems of utilizing engineering manpower, the growth pattern of the engineer, and the engineering aspects of the Hoover Commission reports are major features of the program.

The first of the two day conference will be devoted to a discussion of the use of scientific and engineering manpower with respect to selective service, the Office of Defense Mobilization, education and industry. Representatives of government and industry are included in the panelists who will cover most phases of engineering manpower usefulness.

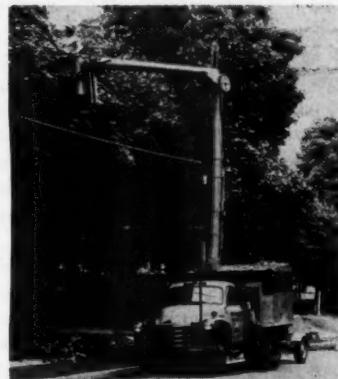
The second day's meeting includes discussions by speakers and panels from education and industry which will consider the problems of engineering education, employers' responsibilities toward the engineering and engineer's important place in research and development with a special look at nuclear power.

Morning and afternoon sessions will be held each day beginning at 10 A.M. and 2 P.M. respectively. There will be luncheon speakers each day and a closing dinner on Friday, Jan. 27.

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Nuclear Plant to Employ 12 Tons

The United States' first full-scale nuclear power plant for the generation of electricity will be fueled by 12 tons of natural uranium in the form of a "blanket" surrounding some 115 pounds of highly enriched uranium "seed," it was revealed on Aug. 15 in Geneva, Switzerland, at the International Conference on Peaceful Uses of Atomic Energy.

Other previously classified details of the pressurized water reactor power plant, which will be located at Shippingport, Pa., near Pittsburgh, were disclosed in a technical paper co-authored by representatives of the Westinghouse Electric Corporation, Duquesne Light Company, and the U. S. Atomic Energy Commission.

The paper was delivered by John W. Simpson, of the Westinghouse atomic power division, Pittsburgh, Pa. Co-authors were: N. J. Palladino, also of the Westinghouse atomic power division, R. B. Donworth and W. J. Lyman, of Duquesne Light Company, Pittsburgh, and I. H. Mandil and M. Shaw, both of the reactor development division, AEC.

Will Begin to Deliver Power in 1957

The revolutionary power plant is part of the U. S. Atomic Energy Commission's program to develop industrial nuclear power. The plant will contain a 100,000 kilowatt turbine generator which will begin to deliver at least 60,000 kilowatts of electricity to homes and industry in the Pittsburgh area in 1957.

Westinghouse, under contract to the AEC, is designing and building the reactor, or atomic furnace, for the plant. Duquesne Light will build the electric generating portion of the plant and will operate the entire plant after its completion.

In addition to the amount and kind of fuel which will be used, Mr. Simpson reported that most of the power from the reactor will come from the fissioning, or splitting, of uranium 235 atoms. Some power will even come from the splitting by high speed neutrons of normally non-fissionable uranium 238.

He said that a "substantial fraction" of the power will come from the splitting of atoms of plutonium—a fissionable product of reacting uranium 238. At the start of the reactor's operation, approximately eight-tenths of a plutonium atom

will be formed for each atom of U 235 that is fissioned. The amount of plutonium increases during the lifetime of the reactor.

Reactor To Have 24 Control Rods

Simpson reported that the reactor will have 24 control rods. The rods will be made of hafnium metal which was selected because it readily absorbs neutrons and thus can retard the atom splitting, heat producing, process. Inserting the rods into the reactor slows the atom splitting. Withdrawing them speeds it up.

Hafnium is obtained during the processing of zirconium—a metal used for structural purposes in reactor construction. Like zirconium, hafnium is highly resistant to corrosion in hot water under pressure.

The vessel which will hold the reactor will have an over-all height of 33 feet. It will be cylindrical in shape and will have an inside diameter of about nine feet. Its walls will be almost nine inches

thick and will be made of carbon steel plates and forgings with a one-quarter inch stainless steel cladding. Total estimated weight of the reactor vessel will be about 500,000 pounds.

Other details released in the paper about the Shippingport power plant include:

The enriched uranium fuel will be made in the form of plates clad with a zirconium alloy. The natural uranium will be made into a cohesive mass and placed in zirconium alloy tubing.

The flow of extremely pure water, which serves both as moderator and coolant, will be 45,000 gallons per minute, for three main coolant loops. Though four loops will be installed, only three will be required for producing the 60,000 kilowatt minimum design power. The water will be under 2,000 pounds pressure per square inch with an average temperature of about 525 degrees Fahrenheit.

Nuclear Portion Housed in Four Steel Containers

The entire nuclear portion of the power plant will be housed in four

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steel containers which, in turn, are in concrete compartments partially below ground level. The displayed scale model shows that from the outside the nuclear power plant does not look too different from a conventional power plant except for the absence of large stacks and fuel storage and handling facilities.

The turbine generator will operate at 1,800 rpm, and the steam conditions at full load will be 545 psig without superheat. The turbine will be equipped with a moisture separator and all turbine blades will be stellite-faced on the leading edges wherever moisture content of the steam exceeds six per cent. These precautions are expected to minimize the effects of the wet steam on the life of the turbine parts.

Simpson also pointed out that on an electric distribution network the frequent changing needs of the customers place special important requirements on the flexibility of the generating plants, and that the Shippingport plant, including the reactor, has been designed to meet these requirements. The over-all

control of the plant, which plays an important part in accomplishing this, will emanate from a single control center and will feature ease and simplicity as necessities for safety and dependability.

The start-up and shut-down requirements of the Shippingport power station are somewhat improved over those of a conventional plant. The time required for the Shippingport station to reach its operating range after a "cold shut-down condition" will be approximately 3½ hours. Following an overnight shutdown, less than 1¾ hours will be required to reach full operation. The time necessary to perform these operations on conventional equipment of this size is 5½ hours and 2½ hours respectively.

Automation Hits Auto Manufacturers

Automobile manufacturers most aggressive in adopting automation had the highest employment in history in the first quarter of 1955, says *American Machinist*, which declares that "it is be-

coming increasingly evident that automation has received attention out of proportion to its significance in the advance of all technology on the broad front."

Bolt Joint Strength Is Made Greater

An unusual method for increasing the strength of bolted joints when subjected to shock loads was presented by Oran A. Pringle, assistant professor of mechanical engineering at the University of Missouri, to the annual meeting of the American Society of Mechanical Engineers in Chicago, Nov. 13-18.

The paper was prepared by Professor Pringle and John Love, Jr., former assistant professor of mechanical engineering at the University and now with the General Electric Company at Norwood, Ohio.

The method involves the removal of a precise amount of material from the shank of the bolt thus reducing the shank to certain optimum sizes which depend on the type of bolt, method of manufacture, and heat treatment.

Although bolts modified in this way weigh less than their original form, their capacity to absorb impact energy is several times greater than ordinary bolts. Pringle said this property may prove valuable in the construction of combustion engines, railroad car carriages, rock crushers, and other machinery where parts are subject to sudden and repeated shock loads.

In addition to the remarkable increase in impact strength, the modified bolt with the reduced shank permits greater stretching or elongation during tightening. Consequently, the nut is less likely to loosen because of vibration. Also, resistance to fatigue failure is increased so that the bolt will last longer in rough service.

The reduced weight and increased strength plus the vibration defying qualities of the modified bolt could prove valuable to the aircraft industries, Pringle said.

The paper, which is based on results of research conducted by the Mechanical Engineering Department and the Engineering Experiment Station of the University, is entitled "The Influence of Shank Area on the Tensile Impact Strength of Bolts."

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Admiral Strauss Speaks at Congress

Admiral Lewis L. Strauss, chairman of the United States Atomic Energy Commission, heads the list of speakers at the All-Congress Dinner of the Nuclear Engineering and Science Congress to be held in Cleveland on Dec. 16.

Admiral Strauss will provide the keynote talk for the more than 2,000 delegates to the congress, the nucleus of which is the program of 300 technical papers on various aspects of progress toward the peaceful uses of the atom.

One of the high points of the week-long gathering, the All-Congress Dinner will be attended by business, industrial and political leaders, in addition to engineers and scientists in the nuclear fields.

Thorndike Saville, president of Engineers Joint Council and dean of the College of Engineering, New York University, will make the welcoming address. Walker L. Cisler, president of Detroit Edison Company and chairman of the Atomic Industrial Forum, Inc., will be

toastmaster, while Dr. John R. Dunning, dean of the Columbia University School of Engineering, will introduce Admiral Strauss.

The congress, coordinated by Engineers Joint Council, begins Dec. 12 and continues through Dec. 16. The Atomic Exposition, displaying the latest devices and materials for industry in the application of nuclear energy with nearly 150 exhibitors runs concurrently with the congress in the Exhibition Hall of Cleveland's Public Auditorium.

Military Engineers To Meet Feb. 9 and 10

The 1956 Annual Technical Meeting of The Society of American Military Engineers will be held in Chicago, Feb. 9-10, 1956 in the Palmer House.

The Chicago Section, host to The Society, is planning another military-industry sponsored program on:

A. The Role of Engineers in an Atomic Emergency—Evacuating key industries and cities; restoration of essential industries, cities, and harbors; protective construction; and communications (road, railroad, bus, air, water, wire, and wireless).

B. Technical Manpower and Production—Number of engineers required in industry, in the military, and in public service (Federal, State, county, and municipal); how these requirements are to be met; and functioning of the new National Reserve Program.

Daniel A. Sullivan, MWSE, secretary of the Chicago Section, is general chairman of the meeting.

Loudspeaker System Used on Erection Site

Loudspeaker systems, connecting the offices of construction companies with workers on the erection site, have solved the problem of communication between the man in the office and the worker on the girder, *Construction Methods and Equipment* reports.

At the New York Coliseum, for example, a well-planned loudspeaker system, which mushrooms as the job progresses, enables an operator at a central telephone switchboard to page to a nearby telephone any worker on the project. To contact his floor foreman, for instance, the office man picks up a phone and calls the job number—the operator pages the foreman to the nearest phone (located on every other floor), and in a few minutes the supervisor has his instructions.

According to the chairman of the operating committee for the joint-venture contractors working on the Coliseum, the loudspeaker system "not only provides excellent contact between the front offices and the job, but it also expedites the flow of materials." When a truckload of materials arrives at the project, the operator can announce what it is and where it is located—an extremely valuable aid, it is pointed out, in a job the size of the Coliseum.

The loudspeakers at the project are placed as soon as the steel is erected. At present, there are 128 speakers on the project from the foundation to the top floor. The speakers and their installation are estimated to cost between \$7,000 and \$9,000, the magazine reports.

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Closed-Circuit TV Is New Giant

"Television as a 'communication tool' was barely known in the beginning of 1955, despite TV's spectacular success as an entertainment and news medium. Today however, the greatest advances in TV are being made in its application to industrial and educational problems; closed-circuit television is unquestionably emerging as an electronic giant."

These remarks were made Oct. 4 at the National Electronics Conference held at the Sherman Hotel, Chicago, by James L. Lahey, general manager of Dage Television Division, Thompson Products, Inc., Michigan City, Ind., manufacturer and pioneer of closed circuit industrial television.

Lahey believes that closed circuit television is entering a period of boom marketing conditions, one which will see equipment demands and sales during 1956 alone surpass the \$4 million worth sold since the industry was born within the last decade.

Lahey said Dage alone, as one major producer in the industry, plans to install more than 1,500 cameras during 1956, thereby exceeding total installations of all manufacturers heretofore.

There are fantastic possibilities for closed circuit television. These can be more easily understood if the TV camera is regarded as an extension of human vision, able to perceive and transmit to viewers miles away or just next door, scenes and information that cannot otherwise be readily or safely viewed.

Prominent among the new uses of TV are signature verification for banks having centralized records or drive-in facilities; remote reading of documents, meters, gauges and other data in distant or hazardous locations; production control, traffic control, process control; materials handling, and innumerable teaching activities at colleges and industry.

Lahey said many of these new uses are made possible by new simplified circuits, developed by Dage to take full advantage of the stable characteristics of the vidicon tube. Recent engineering advances make TV uses possible where light levels are absurdly low. He said the "crowning achievement to date" is the application of the vidicon to color film product equipment which has been installed by Dage and others in many parts of the country.

Leaders in closed circuit TV besides Dage are Diamond Specialty Power Company, RCA and Kay-Lab. A half dozen others have made preliminary installations. Undoubtedly, they will be followed by many more, large and small, eager to take a place in the new TV industry, Lahey predicted.

Aggressive merchandising, advertising, publicity and all other promotional devices can be expected from here on in as sales rise and competition becomes keener. Technically, present and potential users of closed circuit TV can expect a number of advances:

A reduction below the present average cost of about \$2,000 per camera-monitor system.

Improved camera application techniques through the development and use of new automatic controls.

Widened application of color.

As examples of actual installations uti-

lizing closed-circuit TV, Lahey pointed to the following:

—The Towson National Bank, Towson, Md., uses a camera and monitor system to speed signature verification and checking of customer balances between their drive-in teller's office and their centralized accounting division.

—The Potomac Railroad Yard, Alexandria, Va., is the first in the U. S. to use closed-circuit TV on a routine basis for checking boxcar numbers, saving thousands of dollars per year in operating expenses.

—At the Great Lakes Steel Corp.'s No. 3 Slabbing Mill, Detroit, a closed-circuit TV system takes the guesswork out of slab shearing, saving time and money for the firm.

—The Calvary Baptist Church, Lexington, Ky., uses closed-circuit TV regularly to televise services to overflow crowds, thus obviating the need for two Sunday morning services.

—The Palmer House, Chicago, employs closed-circuit TV to speed elevator

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dispatching between the street and lobby floors.

Lahey estimated that of all possible uses for closed circuit TV existing today perhaps only 5 per cent have been covered! Who said there are no new frontiers to conquer.

Pretty Soft - - Hardwood Floors

Children are encouraged to sleep on the floors in the Broward County, Fla. school system.

Odd as it may seem, it's true—notably in the primary grades. The youngsters lie down on small blankets for a 20-minute rest period every afternoon.

Educational experts have recommended this rest as an important step in helping young children make the transition from a day at home to a day at school.

This nap for the children is one of several reasons the Broward County Board of Public Instruction insists on hardwood floors in all of its new classrooms.

The board is currently building classrooms at the rate of 300 per year to handle just about the fastest growing population in the nation—figuring percentagewise. There were 12,000 students in the Broward school system in 1950. When the 1955 school year began there were 28,000.

Paul Colbert, assistant superintendent of education for the Broward schools, said that the board of education decided to use hardwood floors exclusively only after experimenting in early schools with several different flooring materials.

"We found first that in the primary grades, where children take naps in the afternoon, hardwood was warmer in the winter and cooler in the summer than any other material—therefore better from the standpoint of the child's health," Colbert said.

"This fact, in addition to its resiliency, made it a better material for our classroom floors.

"However, there definitely were other factors which entered into the board's original decision to stay with hardwood.

One of the most important was teacher preference," he related.

Colbert explained that teachers universally preferred to work on wood floors.

"They reported wood was easier on their feet and their backs, since they spend so much time on their feet, at the blackboard and the like.

"We actually have had teachers come into our school system from adjoining counties to teach school so they could have hardwood floors in the classroom. It really made that much difference to them."

How about maintenance?

Dudley Rawls, superintendent of maintenance for the Broward school system, is high in his praise of hardwood floors from the standpoint of upkeep.

"Once each year, usually in the summer and sometimes during spring and Christmas vacations, we go into every classroom and take off all the old finish.

"We re-varnish and then re-wax. This finish lasts another year under normal use.

"Our janitors tell us they find our hardwood floors much easier to clean, particularly in sweeping, than those floors in other sections of our school buildings where we have used other flooring material.

"Taken on an individual basis, it doesn't seem like much advantage, but reckoned in terms of time saved in each of our schools throughout the county, it totals a good many man-hours," Rawls declared.

Since termites are a particular problem in warm, damp Florida—unless proper precautions are taken—all ground beneath school buildings is treated thoroughly against the pests before construction ever begins.

Don't Run!

Quitting-time rush, which can lead to accidents, is being tackled by a Hartford, Conn., plant by means of candid pictures, *Factory Management and Maintenance* reports. The plant safety engineer took pictures from the roof of the plant at quitting time, showing employee making a reckless dash for cars and buses. The pictures, printed in the plant paper, were placed next to a 1954 U. S. tabulation of pedestrian accidents due to jaywalking.

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Marquette Tells Construction Plans

Marquette Cement Manufacturing Company recently announced plans for immediate construction of a 1,250,000 barrel a year cement producing plant at Milwaukee, Wis., to serve Wisconsin and northern Illinois markets. Purchase of a site in Milwaukee's industrial dock area near Lake Michigan was completed Oct. 20. The new production facilities are expected to be in opera-

tion by the end of next year (1956).

"Unusual cleanliness and efficiency will be outstanding features of this new plant," said W. A. Wecker, Marquette president. It will employ the first "double pass" Lepol kiln to be installed in the United States, he said. The Lepol kiln, used by European cement manufacturers for many years, has only recently been developed and improved for American manufacture. The Marquette kiln at Milwaukee will be only 165 feet long, as compared with 450 feet for the

usual kiln of comparable capacity.

Besides the essential kiln, the plant when completed will include storage silos with a capacity of 250,000 barrels of cement, a large outdoor storage area for raw materials, loading and shipping facilities and a Marquette dock on the adjacent canal. Raw materials and fuel will be delivered directly to the dock by self-unloading water carrier. Rail transportation service will be provided by the Chicago, Milwaukee, St. Paul and Pacific railroad.

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C-4127 SUPT. Age: up to 43. 3 plus yrs. exp. in superv. people in mfg. industry. Know: tooling punch press & welding. Duties: resp. for all production. For Mfr. of steel chairs & stands. Sal: \$8-9000. Loc: Wisconsin.

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C-4170 DEVELOPMENT ENGR. ME. Age: 35-50. 5 plus yrs. exp. as a proven designer of machine tool or working devices. Know: machine shop practice. Duties: superv. taking new machine tools from patent stage to production design through test pilot models, etc. For Mfr. of tools. Sal: \$9000-\$14,000. Loc: Florida. Empl. will pay the fee.

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381 MW ADM. ENGR. 42. EE. 1 yr. des. of high voltage lab. & eqpt. 2 yrs. des. of ind. & comm. lighting eqpt. 4 yrs. superv. of steam generating & substation design-drafting. \$10,000. Midwest.

Electronics Solves Gas Problems

Engineers, aided by electronics, are solving two of the vexing problems in transmission and distribution of natural gas — pipeline pulsation vibration and noise — a report issued in Dallas, Tex., by Burgess-Manning Company reveals. The report, illustrated with oscillosograms, drawings and photographs, reviews case histories of seven specific problems solved in the East, South West and Mid West by electronic analysis that indicated the nature of the problem and led to its solution by reducing vibration and eliminating excessive noise.

S. G. Paddock, vice president of Burgess-Manning Company, pioneers in the reduction of industrial noise and vibration control, pointed out that pipeline vibration and noise are the result of compressor action during pumping operations, during transmission, and in pressure reduction units in the distribution of gas.

The eight case histories cited in the report range from an analysis of plans for a transmission line in order to avoid

pulsation, to analysis and solution of a vibration problem that had forced the shut down of a compressor plant.

Survey and analysis of such problems in an operating plant entail the use of electronic equipment consisting of a pressure pick-up (transducer) and amplifier and an oscilloscope.

In the case of the gas distribution station that was unable to operate at design conditions, a survey indicated that uncontrolled compressor speed variation was possibly caused by periodic overloads on the compressor due to surge resonance in the piping. Pulsation snubbers, especially designed, were installed at designated points in the system and eliminated the pulsation problem. The compressor now operates at noted conditions.

In another case cited, a major petroleum gas processing plant, using gas driven compressors, there was excessive vibration and noise in the discharge piping from several of the compressor stages, necessitating constant pipe maintenance, and reportedly causing operator

fatigue and concern. Line breakage also was attributed to the vibration. Analysis disclosed the extent of surge in the compressor piping and resulted in the installation of gas and air line snubbers in two lines where the maximum difficulty was found. The plant is now operating satisfactorily.

In the case of forestalling vibration before it occurred, a large natural gas pipe line company called in Burgess-Manning engineers while their new transmission line was in the planning stages, to avoid expected problems of harmful vibration and low compressor efficiency. A study of the plans indicated the installation of suitable snubbers. Thus, when the transmission line was ready to go into service, suitable suction and discharge pulsation snubbers of the manifold type were ready to do their damping job.

Amen!

If man could have Half his Wishes, he would double his Troubles.

—Poor Richard's Almanack

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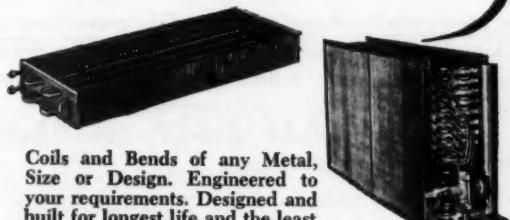
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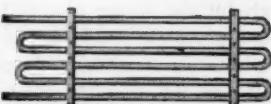
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Reviews of Technical Books



Water Supply Engineering

Water Supply Engineering, by Harold E. Babbitt and James J. Doland, McGraw-Hill Book Company, Inc., New York, N. Y., 1955. 608 pages. Price \$8.50.

The fifth edition of this well known textbook presents the latest accepted practices in water works. It is the most complete book on the subject and covers public, private and industrial water supplies. In effect, all the necessary information is presented so that the book could serve as the only necessary reference for the design of a complete waterworks.

The material covered includes hydraulics, hydrology, water supplies, distribution system design, pumps and electrical equipment, water quality and treatment plant design.

The material is well illustrated and brings together in one volume established methods and new developments. This book, in addition to being a good textbook should be a standard reference volume for sanitary engineers, civil engineers and all others concerned with the design and operation of water works.

J.C.S.

Prestressed Structures

Design of Prestressed Concrete Structures, by T. Y. Lin, John Wiley & Sons, Inc., New York, 1955. 456 pages. Price \$11.50.

This textbook intends to compile a comprehensive review of American methods and procedures of design of prestressed concrete structures. Although the text is primarily concerned with design it does cover materials and methods of prestressing and economic factors.

The book contains chapters on materials, prestressing systems, loss of prestress, analysis for flexure, design for flexure, shear bond and bearing, deflections, partial prestress, continuous beams, slabs, tension and compression members, circular prestressing, allowable stresses and load factors, economics and special problems.

Both elastic and ultimate design are presented side by side for the case of flexure, shear bond and direct load. Methods for the design of continuous beams and slabs, including the location and concordancy of cables, are presented in simple terms of moment diagrams and moment distribution. It assumes that the readers will possess a working knowledge of strength of materials, reinforced concrete and elementary structural analysis and design.

B.A.W., W.S.E.

Waste Treatment

Principles of Industrial Waste Treatment, by C. Fred Gurnham, John Wiley & Sons, Inc., New York, N. Y., 1955. 399 pages. Price \$9.50.

This textbook presents for the first time the study of industrial wastes from the "unit operations" viewpoint. This method of analysis enables the reader to understand present and future developments in all phases of the waste treatment field.

The majority of the material is devoted to the actual operations and process used to treat wastes before their discharge to municipal sewers or natural water courses. In addition, the book covers pre-treatment operations, physical treatment, chemical treatment, biological treatment, and final disposal. The author has also covered the source of wastes, their pollutive effects and a review of the major industrial problems.

This is an excellent textbook and should be in the reference library of all engineers concerned with industrial waste treatment.

J.C.S.

Boundary Layer Theory

Boundary Layer Theory, by Herman Schlichting, translated by J. Kestin, McGraw-Hill Book Co., Inc., New York, 1955. 535 pages. Price \$15.00.

This book is a translation from the German original, first published in 1951. It is not a literal translation of the German edition since the author had rewritten a number of chapters and has made smaller additions in various places in the book.

Boundary layer theory is the basis of knowledge of the flow of air and other fluids of small viscosity of interest in many engineering applications. Many complex aerodynamic problems have been clarified by a study of the flow within a boundary layer and its effect on the general flow around the body. This book treats this important part of modern fluid dynamics comprehensively.

The book introduces the mathematical and physical background of the problem involved in viscous flow. The basic equations of the boundary layer theory as they are derived from the Navier-Stokes equations of motion are discussed in detail. The theory is then extended to the laminar and turbulent boundary layer and attention is given to the problem of the development of turbulence.

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CRERAR LIBRARY

News and Notes

During its first sixty years of service, Crerar Library has operated as a reference library—that is, books were to be used only in the reading rooms. Exception to this was made in the loan of materials to other libraries when needed by their patrons and not available locally; such material was to be used in the borrowing library's reading room to conform with Crerar practice. These interlibrary loans are liberally granted, and during 1954, some 1500 items were so used.

The loan policy has of course been a boon to some and a curse to others. Those persons coming to the Library were almost certain to find the material desired. On the other hand, research workers in companies lacking formal libraries were denied the convenience offered by the loan system. With growing support of the Library's program by many such companies, it has become evident that some adjustment was necessary, in recognition of this interest.

By action of Crerar's Board of Directors, a new loan policy became effective November 4. The loaning of material to public libraries and to libraries of educational institutions will continue on the same liberal basis as heretofore. Loans to other organizations, however, will be determined not by whether a library exists in the organization, but by the holding of a Crerar Library Membership. Individual members, as well as employees of company members, will be permitted to borrow library materials within the limits described in a booklet to be distributed to them. These loans will be made on receipt of letter or telephone requests from designated liaison personnel in companies, or from individual members. Loans will also be made to employees of company members presenting valid membership cards at the circulation desks.

Certain types of books will not be available, such as much-needed hand books, rare volumes, and current issues of a few English language journals in frequent demand. Most English language material published during the past two

years may be borrowed for at least one day; foreign language items may be used for three days.

* * *

Gift funds can, and often do, play an important role in keeping the current acquisitions of the Library at a high level. Three recent gift funds are serving this purpose. The first is an additional grant of \$1,500 from the Illinois Division American Cancer Society, for the purchase of books and periodicals which may contribute to the progress of cancer research. The new grant brings the total from this society to \$9,900 since the first grant was made in 1948.

The Chicago Heart Association has also made a grant of \$1,000 to the Library for purchasing publications relating to heart research. The total amount which has been granted to Crerar Library by this association has now reached \$4,600 since 1949.

The third gift is \$130 from the Chicago Section American Chemical Society, representing income for one year from the Vladimir N. Ipatieff Fund. This fund, left in part by the will of Professor Ipatieff and the remainder by an anonymous donor, is administered by the Chicago Section ACS with the income designated for purchase of books in the field of chemistry for The John Crerar Library.

Good Counsel

Altho' thy teacher act not as he preaches, Yet ne'ertheless, if good, do what he teaches. Good counsel, failing men may give, for whv, he that's aground knows where the shoal doth lie.

—Poor Richard's Almanack

Old 60" Searchlight Adapted for New Use

The old 60-inch searchlight of World War II has been adapted for a new role by the Illumination Section of the Corps of Engineers' Research and Development Laboratories, Fort Belvoir, Virginia.

Supplanted by radar for aircraft detection, it has been transformed into a self-contained mobile unit to supply battlefield illumination or "artificial moonlight" for combat operations.

Originally designed for transport in two trailers towed by a pair of 2½ ton trucks, the entire unit has been mounted on a single truck of the same size. The old method of transporting the unit was adequate for anti-aircraft units emplaced in rear areas, sometimes at the same location for days.

Mounting the entire unit on one truck, however, became necessary to permit the rapid and frequent movement required for frontline battlefield illumination.

The new truck is equipped with sides which can be let down to form a platform for the operator. The engine generator set which powers the unit is mounted directly behind the cab of the truck.

Army units achieved much success in Korea by locating the searchlights five to 10 thousand yards behind the area they wanted illuminated and directing the beams at a low elevation.

Light, scattered from the beams, provided illumination equivalent to an almost full moon over an area 800 yards wide and 1500 yards long. Greater width but less illumination was obtained when they defocused the beam.

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WSE Personals

Elmore S. Pettyjohn, MWSE, since 1945 director of the Institute of Gas Technology, affiliated with Illinois Institute of Technology, has announced his resignation, effective Nov. 30.

Dr. Henry R. Linden, research director, will serve as acting director until a successor to Capt. Pettyjohn is selected.

Pettyjohn said, "I came to the Institute of Gas Technology with the intent of staying five years, and firmly establishing it as the research and educational facility of the gas industry, the nation's sixth largest industry. The task has taken twice that time, and I leave it to you to judge that it has been well done."

Dr. J. T. Rettalata, MWSE, president of Illinois Institute of Technology and of IGT, said, "We recognize the many contributions made by the Institute of Gas Technology under Capt. Pettyjohn's administration. We thank him for the good work he has done, and wish him well in his future activities."

Pettyjohn, with broad operating and research experience in the gas industry, and eight years as a professor of chemical engineering and gas engineering at the University of Michigan, was appointed director of IGT in 1945 after service with the U. S. Navy in World War II. In 1952 he was named vice president in recognition of his contribution to the Institute's rise to its present eminent position in the fields of research and education.

Dr. Lester Horwitz of Midwest Research Institute, Kansas City, Missouri, has been presented the Technical Paper Award Certificate for 1954 for the outstanding technical paper of the year by the Photographic Society of America at its annual convention in Boston on October 8th. The title of the award-winning paper was "Mechanisms of Color-Sensitization" which discussed the basic mechanisms underlying the ability of certain compounds to transfer energy they absorb. Several theories presented in the paper have been substantiated in subsequent experiments.

Dr. Horwitz is engaged in organic chemistry research at Midwest Research Institute. Previously he was with the General Aniline and Film Corporation

as senior research chemist of the Ansco Division. He has also been associated with Schenley Laboratories and as an instructor at New York University, from which he obtained his Ph. D. degree. Among the societies to which he belongs are the American Chemical Society, Photographic Society of America, American Association for the Advancement of Science, and the London Chemical Society.

James W. Davidson, MWSE, formerly an engineer-draftsman with the Chicago, Burlington & Quincy Railroad Company, has been appointed assistant bridge engineer with the company. His headquarters are in Chicago.

Robert G. Burkhardt, MWSE, is now a consulting engineer, with offices at 407 South Dearborn st., Chicago 5. The telephone number is HArrison 7-5540. He was previously associated with the firm of Naess & Murphy.

The Chicago office of the Granco Steel Products Company are now located at 307 North Michigan ave., Room 923, Chicago 2. The new telephone number is FInancial 6-3065. The announcement was made by Ken R. Grearson, MWSE, district manager.

Howard L. King of New York and Harvey Slocum of Alhambra, Calif. were recently named as the 1956 recipients of the awards given annually by The Moles for "outstanding achievement in construction."

The announcement was made at a dinner meeting of The Moles, a society of

leading figures in the tunneling and heavy-construction industry, at the Biltmore Hotel. Formal presentation of the awards will be at the annual Awards dinner at the Waldorf-Astoria hotel next February 2. King and Slocum make up the 16th pair of honorees in a series that started in 1941 and numbers among its winners former President Herbert Hoover HMWSE, Robert Moses, Admiral Ben Moreell and the late General Breton B. Somervell.

The award is considered the highest recognition that can be accorded service to the American construction industry. It is made annually to one member of the society and one non-member. King is the member winner. Announcement of the selections was made by Eugene F. Moran Jr., awards committee chairman.

King, vice president and chief engineer of the Mason & Hanger company, is a native New Yorker and an expert in compressed-air sub-aqueous tunnels. He has played important roles in driving many of the principal underwater tubes serving New York City. He is a graduate of The City College of New York and holds bachelor of arts degrees from there and from Columbia University, and a bachelor of science degree from Massachusetts Institute of Technology. His home is in Port Washington, L. I.

Slocum, on the other hand, had no classroom schooling beyond the eighth grade, but is regarded as the world's outstanding builder of concrete dams. He is now in India building the gigantic Bhakra Dam, and has been the general contractor's project manager for many of the largest dams in this country, among them Grand Coulee, Hetch-Hetchy, Madden Dam, Friant Dam, Davis Dam, and Bull Shoals Dam.

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"Roughing It" Now Made Easy

Camp housing that brings more of the outdoors indoors without the discomforts of "roughing it" has been developed at Illinois Institute of Technology, Chicago.

A permanent structure for year-round use and a demountable type shelter have been designed by students at IIT's Institute of Design in a \$5,000 experimental shelter design project for the Young Men's Christian Association of Chicago.

The new structures retain the primitive quality characteristic of camp living but utilize contemporary materials, according to Charles Forberg, assistant professor of shelter design at Illinois Tech.

They have been erected on YMCA campsites along Lake Hastings near Lake Villa, Ill., 55 miles north of Chicago.

Significant features of the new sleeping and living quarters are:

—A greater degree of openness than in traditional camp shelters.

—A reduction of 10 degrees in the inside temperature.

—Greater flexibility in the arrangement of camp housing and selection of campsites.

—Minimum maintenance as a result of the choice of materials.

The structures will be used as experimental units by the Chicago YMCA to get the reaction of the campers and to evaluate the stability and desirability of the buildings, according to Raymond R. Ramseyer, metropolitan boys work and camping secretary of the Chicago "Y."

"If the experimental units prove successful," Ramseyer said, "the Chicago YMCA will use the new type structures

exclusively throughout its one undeveloped property."

Constructed on a concrete slab with inside floor space of 16 x 20 feet—it provides sleeping quarters for eight campers and a counselor. Height of the structure is 13½ feet at the ridge point.

Designed in a "A" frame, or tent-shape, it features an 8 x 16 strip of translucent fiberglass in the roof that permits sunlight to enter the cabin but deflects much of the heat of the sun. The five remaining roof panels are corrugated aluminum.

All of the roof units can be assembled on the ground, complete with wood framing, half-inch building board, aluminum roofing or fiberglass, and then tilted into position to speed up the construction process, Forberg explained.

Three plywood doors, painted a brilliant blue and white, open out at either end of the shelter to create a closer relationship with the outdoors. Glass fiber screening protects the campers from insects.

Continuous ventilation is provided winter and summer through folding plywood vent panels at the lower edge of the roof and through vents at the ridge point.

Special double-deck bunks will be modified to fit into the slope on one side of the structure, leaving the other side open for cabin activities. Space created between the beds by the slope will be used for storage units.

The second project is a demountable type structure planned as a summer shelter.

It can be moved around the campsite to regroup the camp for different age

groups, for segregating boys and girls, or for a change of scenery, Forberg pointed out.

The problems faced in designing temporary structure were to keep it as light as possible yet durable to withstand handling and to keep it independent of the camp site so that all parts would remain with the building.

This was solved by using a steel tubing framework covered by two types of fabrics and attaching it to a floor formed of 10 stressed skin box beams that fit into a 12 x 20 foot frame. Tripod footings, adjustable within a 2½ foot range, support the frame at four points.

The upper part of the steel tubing framework is covered in neoprene coated nylon with a top surface of aluminum pigment. Frequently used for truck tar-paulins, it is only half the weight of usual tent material, has a greater resistance to rot and abrasion than canvas, and reflects a large percentage of the heat of the sun.

A translucent white nylon fabric with a water repellent finish is used to cover the lower sections which form the sides of the structure.

The end panels are screened with an orlon net screening and are equipped with the same translucent nylon fabric panels to conceal the ends in inclement weather.

The temporary structure—somewhat similar in shape to the canopy of a covered wagon—will house six to eight campers.

"A Steak's Worth Of Rivets, Please"

Pricing banana splits, steaks, etc., in terms of rivets and bolts has gone a long way to cut down small-part waste at a New York aircraft plant, according to *Factory Management and Maintenance*. The plant's conservation coordinator, noting that many workers had been tossing away bolts and rivets unnecessarily, published pictures in the plant bulletin, showing workers paying for various edibles with bolts and rivets—a steak at a butcher shop, for example, cost half-a-dozen bolts.

A Thought...

The Wise and Brave dares own that he was wrong.

—Poor Richard's Almanack

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Applications

In accordance with the By-Laws of the Western Society of Engineers, the following names of applicants are being submitted to the Admissions committee for examination as to their qualifications for admission to membership into the Society in the various grades, i.e., Student, Associate, Member, Affiliate, etc. All applicants must meet the highest standards of character and professionalism in order to qualify for admissions,

33-55 Robert W. Shuldes, Associate Research Engr., Armour Research Foundation, 10 W. 35th St.

34-55 George L. Irvine, Commercial Vice President, General Electric Company, 840 S. Canal St.

35-55 Robert G. Claussen, Box 473, Dubuque, Iowa, — attending Loras College.

and each member of the Society should be alert to his responsibility to assist the Admissions committee in establishing that these standards are met. Any member of the Society, therefore, who has information relative to the qualifications or fitness of any of the applicants listed below, should inform the Secretary's office. The Secretary's office is located at 84 East Randolph Street. The telephone number is RAndolph 6-1736.

36-55 George H. Horne, Methods Engineer, Link-Belt Company, 2410 W. 18th St.

37-55 Paul A. Christopher, District Manager, Stephens-Adamson Manufacturing Co., 20 N. Wacker Dr.

38-55 Irwin Rosenak, Chief Engineer, Inland Steel Company, East Chicago, Ind.

39-55 Morris A. Jones, Jr., Junior Design Engineer, Acme Steel Co., 134th & Clark, Riverdale, Ill.

40-55 Richard F. Draus, Junior Design Engineer, Acme Steel Company, Riverdale, Ill.

Transistors Used For Torpedo Control

The Bureau of Ordnance, U. S. Navy, has announced the development of a new ultrasonic control system for torpedoes, in which, for the first time, transistors are used to replace completely the usual assortment of electronic tubes.

Developed by scientists at the Westinghouse Research Laboratories, the fully transistorized system brings to torpedo control all the proven advantages of transistors including extreme ruggedness, small size, high reliability of operation, and low electrical power requirements.

Purpose of the control is to automatically direct the path of a torpedo to an enemy target. It does this by utilizing sound waves in the water. Once the torpedo is launched, the control "takes over" and causes the torpedo to seek out and follow its target without human assistance.

The group of Westinghouse scientists who developed the new electronic control was headed by Arthur Nelkin of the Research Laboratories' electronics and nuclear physics department.

"Transistors are particularly suited for use in electronic control circuits and especially this torpedo control," Nelkin said. "In addition to their other advantages, transistors do not require high-voltage direct current for their operation as do electronic tubes. Transistors can operate directly on the low voltage of the torpedo battery. This eliminates a separate source of electric power and makes the control system more simple and compact. Furthermore, the total power required is only about one-tenth that of an equivalent control using electronic tubes.

"Another advantage of transistors lies in the fact that they do not have heated filaments, which require 'warm up' time," Nelkin declared. "This means that the transistorized torpedo control is ready for instant operation, without the usual delay of 30 seconds or more, which electronic tubes need for 'warm up' and stable operation."

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Obituaries

The Western Society of Engineers has recently been notified of the following deaths:

Hal W. Goodman, the Society has been informed, died on January 31, 1955. He had joined the Western Society in 1929. A civil engineer, Mr. Goodman had been a resident of Ohio for many years.

* * *

Henry J. Kaufman, formerly an advisory field engineer, died on June 15, 1955. Mr. Kaufman had been a member of the Western Society since 1914. He became a life member in 1944. He was especially interested in the Electrical, the Hydraulic, Sanitary and Municipal, and the Mechanical Engineering committees.

* * *

Robinson S. Moss, who joined the Society in 1906, died in Los Angeles where he had resided since 1922. The exact date of his death has not been received. Dr. Moss became a life member of the Western Society in 1937.

* * *

Hugh J. Fixmer, a member of the Society since 1908, died August 15, 1955. He had recently retired as assistant chief engineer with the Chicago Bureau of Streets after 50 years of service with the city. Mr. Fixmer had been a life member of the Society since 1941. He served on a number of committees during his many years of membership, and had been especially active on the Civic Committee.

* * *

Thomas A. Jordan, a life member of the Western Society of Engineers since 1949, died on October 12, 1955. Until 1946, when he retired from that organization, he was assistant division engineer of the American Bridge Division of the United States Steel Company. More recently he had been a consulting engineer. Mr. Jordan joined the Society in 1919.

* * *

A. G. Shaver, who was awarded the Octave Chanute medal for 1938-39 for his paper on electrical engineering, died October 1, 1954, the Western Society has recently been notified. He had acted as consulting engineer in Danville, Illinois. Mr. Shaver joined the Society in 1920. He was a life member of the Society.

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Tool Engineers Plan Exposition

The American Society of Tool Engineers, in recognition of the tremendous strides in production tools and accessories, has announced that "Tooling for Tomorrow" will be the theme of its 1956 Industrial Exposition. The Exposition will be held in conjunction with the Society's 24th Annual Convention at the International Amphitheatre in Chicago March 19-23.

In making the announcement Executive Secretary Harry E. Conrad, stated that "Tooling for Tomorrow" is an especially appropriate theme at this time because our economy is undergoing what many term "The Second Industrial Revolution." He pointed out that technological changes are coming about so rapidly that new tooling concepts must result. A thorough review of present tooling facilities has become a virtual necessity.

Today's tooling must be critically analyzed because, as cited by Conrad:

1. Problems associated with increased operating costs are becoming even more acute in our present expanding economy.

2. Population increases and rising standards of living are snowballing the demand for consumer goods to such a degree as to, in themselves, make present production methods and facilities inadequate.

3. Rapid technological developments and scientific advances are providing improvements so rapidly that new equipment is becoming obsolete much more quickly. Continual replacement or modernization of facilities has become a must to remain competitive.

4. Tax law liberalization with regard to amortization may make a reconsideration of tooling programs much more attractive than in years gone by.

5. Recent developments in the automatic control of machines now makes it possible for even small limited-production manufacturers to use automation economically.

6. New "wonder materials" and processes for tooling and manufactured products are becoming available almost daily. Utilization of these to best advantage will necessitate completely new tooling.

Summarizing, Conrad said that today's tool engineer dare not become complacent. He must maintain a dynamic

viewpoint, continually examining new developments for potential value.

The ASTE Industrial Exposition provides the tool engineer with a market place for ideas where he will be able to compare advanced ideas of the latest in tooling. He will also have the opportunity to gain additional knowledge from the 60 technical papers and 12 plant tours offered, all designed to help him better plan his "Tooling for Tomorrow."

Aluminum Protecting Methods Described

Two methods for preventing the corrosion of aluminum in high temperature nuclear power reactors were described Aug. 18 at the United Nation's International Conference on the Peaceful Uses of Atomic Energy by Dr. Joseph E. Draley, senior chemist, Metallurgy Division, Argonne National Laboratory.

Aluminum metal has been used extensively as a fuel cladding material in water cooled reactors operating at low temperatures. It is resistant to corrosion by the water and does not seriously absorb or interfere with the vital energies at work within the reactor. However, at temperatures above 400°F., aluminum and common aluminum alloys have poor corrosion resistant properties and this has prevented their consideration in most commercial designs for power producing nuclear reactors. Substitute materials, such as zirconium, are much more expensive and are generally more difficult to fabricate and process. The use of stainless steels adds to operating costs because of their tendency to absorb neutrons.

Dr. Draley reported that commercially pure aluminum corrodes smoothly at a reasonably low rate in pure water at temperatures up to about 400°F. Above this temperature, the corrosion shifts to a penetrating attack, with the formation of mixed metal and oxide at an accelerating rate. This type of attack, reported Dr. Draley, weakens the metal and at temperatures of about 600°F. rapidly converts the metal to oxide.

Research work conducted by Dr. Draley and Mr. W. E. Rutherford of Argonne's Metallurgy Division has indicated that penetration of the metal by hydrogen, produced in the corroding process, is responsible for this type of accelerating attack.

The two methods of preventing aluminum corrosion at elevated temperatures which were developed by Draley and Rutherford were described as follows: The first method consists of incorporating small amounts (1/2 to 1%) of nickel and iron in aluminum which makes an alloy that is impervious to penetrating corrosion up to at least 660°F.

The other method involves the addition of minute amounts of nickel sulfate to the water which is made acidic by the addition of sulfuric acid. This procedure protects commercially pure aluminum up to temperatures of at least 530°F.

The development of methods for using inexpensive aluminum in high temperature power reactors is regarded as an important factor in the production of economical atomic power.

To Hold Meet on Operations Research

How does Operations Research work in practice? It's a question often asked these days and the Operations Research Group at Case Institute of Technology at Cleveland, Ohio will provide some of the answers at a three day conference to be held on the campus, Feb. 1-3, 1956. Titled "Case Studies in Operations Research—A Cross Section of Applications in Business and Industry," the conference will emphasize specific applications of Operations Research in a variety of industries.

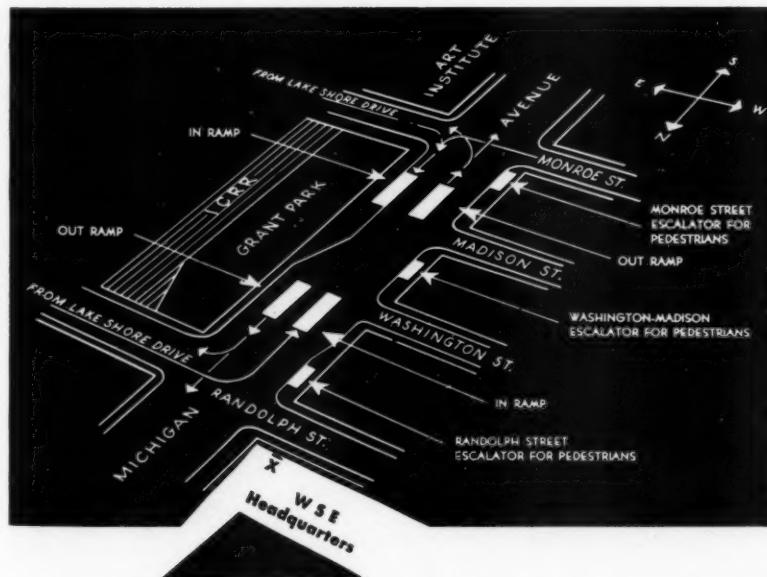
Conference leaders will include recognized Operations Research experts from business and industry as well as members of the Case O. R. Group, generally recognized as one of the finest in the country. The presentation of five case studies, each from a different type of business and each in a different phase of business, will be made jointly by a representative of management and the Case O. R. staff. This variety of presentations will provide management with an opportunity to appraise and discuss Operations Research with respect to their own problems on a practical rather than theoretical basis. In addition to the formal sessions, small groups will meet each afternoon with the conference staff to explore the cases, methods, and types of organization presented by the speakers and to discuss problems presented by the conferees.

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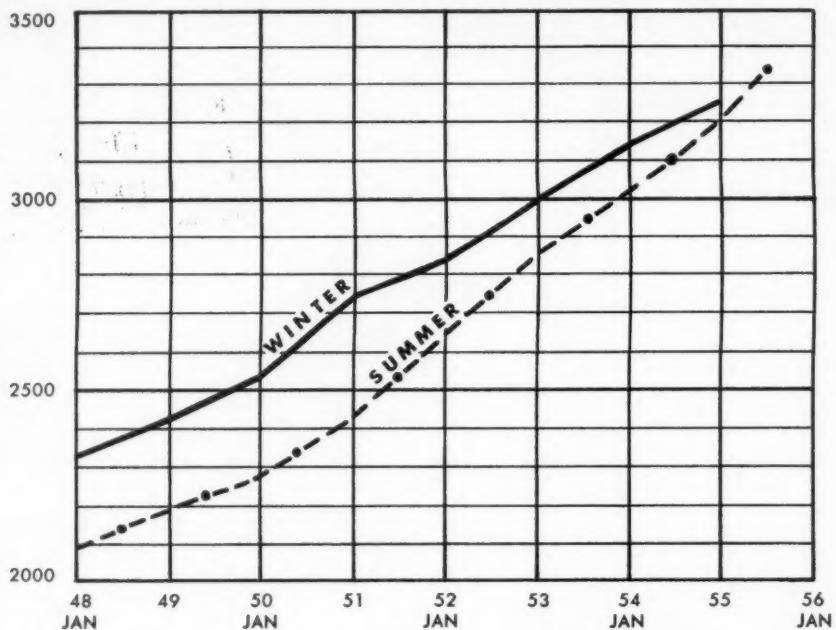
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